Power cycle recovery and checkout for the muon detector systems

Our advice

Following a power outage in a muon front end crate, the advised procedure for checkout is to take a cosmic ray run of reasonable length (30 min.) with at least the muon detector (chamber and scintillator) HV on.

The output YMon should be checked against the cosmic ray reference plots available by clicking on the detector links on this page.

If the power outage included TDC crates, the output of TrigMon should also be checked. Be sure to include at least the muon trigger crate (MUTR00) in the run so you get the muon trigger primitives readout. A more useful run would have the full trigger and COT HV on. A general discussion is given below.

Known failure modes

We have had a couple of instances where, after power cycling of TDC crates, one or several TDC have "failed" in recoverable ways. Some simply won't pass cold start. These are easy to identify. Others have produced spurious trigger data although they don't cause readout problems. This is easily visible in the TrigMon plots for the relevant detectors comparing "real" and "simulated" triggers. The simulated triggers are a simulation of the trigger hardware from the TDC hits. Any sizable discrepancy is serious.

Problems should be referred to the TDC pager. Reseating typically fixes most problems; occasionally one may need to replace a TDC.

Summary of Readout Crates

Muon Front End Crates			
ASD	CMU	in ccalXX crates on calorimeter arches	VME
ASD	BMU/CMP/CMX	individual crates mounted on detector steel	modified RABBIT
TDC	BMU/BSU/CMP/CMU/ CMX/CSX/CSP/TSU	counting room	ECL, VME

General Discussion

Crates in the collision hall

We don't cycle crates in the hall remotely. We do turn off crates when we replace cards. The scummy calorimeter types cycle the crates in which the CMU ASDs reside both remotely and in the hall. In the first case we check things out ourselves; this would require help from the shift crew (calibration or cosmic runs), but we do the checkout. The second case requires the shift crew to check things out; we generally don't know that this happens. The aforementioned scumbags also cycle 400 Hz to parts of the detector. This has at least once tripped off a low voltage supply in the muon system. This required an access. We were not pleased.

Crates upstairs

We don't cycle the power on TDC crates intentionally. TDC are inserted hot, and I believe TOF trigger boards as well. (We share CMX01 with TOF.) Power cycling is bad news as you can tell from the discussion above.

CMU ASD

A run with a cosmic or physics table including these chambers will at least check that they respond. The calibration is not yet working. Some level of checkout can be performed on the data from a cosmic run with HV on. Distributions are asymmetric due to the source, but gross problems would show up in the occupancy plots. An ASD has 48 channels; there is 1 ASD/wedge.

BMU/CMP/CMX ASD

A muon calibration will check that the readout is intact. However, there is no feedback from this calibration to the shift crew. Detector experts can be contacted to analyze and interpret the data. A cosmic run with HV on is your best bet for checking these ASDs. (Unlike CMU, there is nothing to be gained from a physics run as these cards are dumb.) Distributions are asymmetric due to the source, but gross problems would show up in the occupancy plots. An ASD covers 48 channels: 12 stacks in BMU/CMP, 1 wedge in CMX. They are grouped in several crates. These are north wall, top, south wall, bottom in CMP and NW, SW, NE, SE in CMX and BMU.

Muon TDC

A run with a physics or cosmic table including these crates will check that they respond. A muon calibration has the advantage of exercising the TDCs with higher occupancies than a cosmic run and the disadvantage of not providing any feedback to the shift crew (see discussion above). As described above, a cosmic run would show gross problems. A TDC has 96 channels: 24 stacks in BMU/CMP; 2, 15° CDF wedges in CMU/CMX. There are two crates each of BMU+BSU+TSU/CMU/CMX (west/east), 1 crate of CMP and 1 crate of CSP+CSX. The CSP/CSX TDC channels don't show up as contiguous channels in the occupancy plots. TDC problems are, thus, harder to spot. (TDC crate to detector channel maps can be found here.)

Daughter boards on the TDCs generate muon trigger primitives. They have the same segmentation as the TDCs.